PP20— Basic Considerations

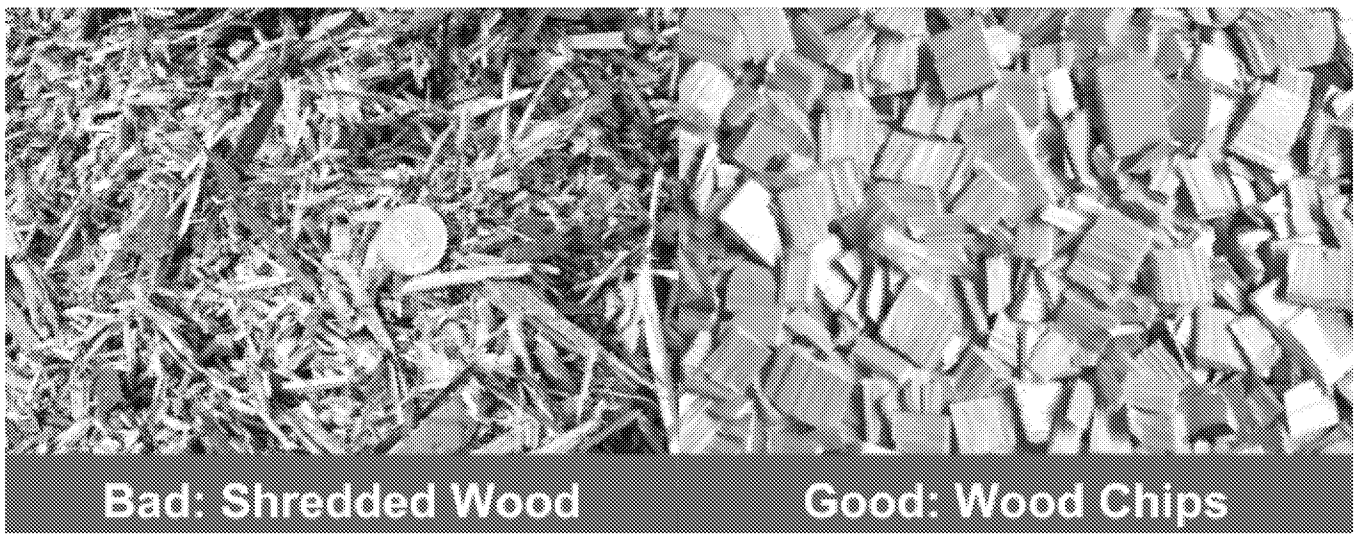
Important information for prospective buyers

Feedstock Requirements

The PP20 requires feedstock consisting of pieces larger than ½ inch, but smaller than 1 ½ inches. (Larger than 1 cm, smaller than 4cm.) The moisture level of the feedstock must be under 30%; best performance is obtained with moisture content less than 25%.

Restrictions

Currently, the only approved feedstocks wood chips, coconut shells, tree nut shells (except for Almond husks), and corn cobs (with increased maintenance). **Note**: do not confuse wood chips with wood shavings or shredded wood. Shavings and shreds are not suitable because of constant feedstock jams. The following examples contrast chipped wood from shredded wood:



Feedstock Processing and Handling

Chipper

The most commonly used feedstock with the PP20 is wood chips. If you intend to use wood chips with the PP20, you will need a wood chipper. The acceptable chip size range is 1 cm to 4 cm. The two popular options are auger chippers and disc chippers. Auger chippers (such as the Laimet brand from Finland) use one auger per chip size. These chippers produce very consistent chips, but are significantly more expensive than disc chippers.

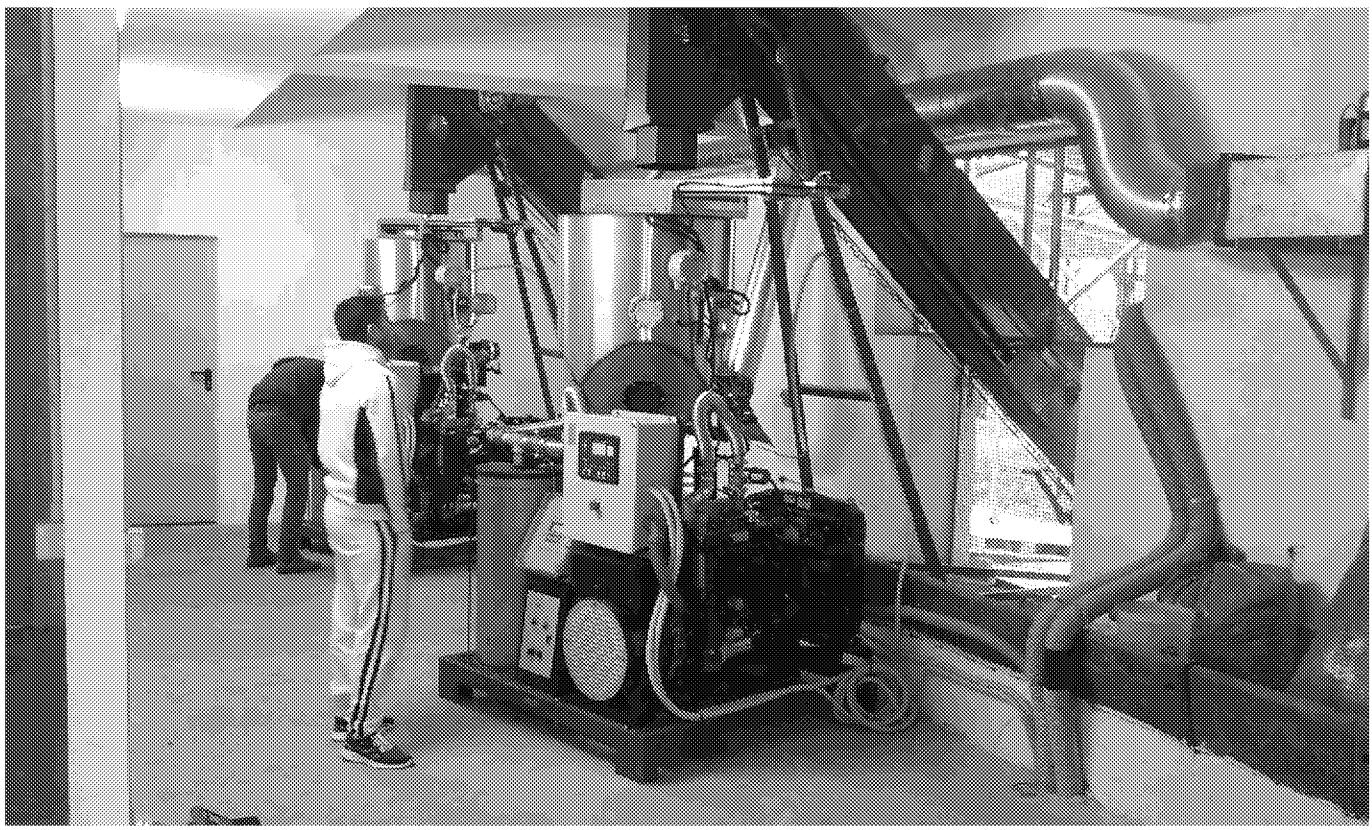
Sifting

The PP20 ships with several screens for manually sifting feedstock and filter media. For cost effective preparation of large quantities of feedstock, we recommend preparing a mechanized sifter.

Continuous-Feed Hopper Lid and Conveyance

For applications which subject the PP20 to continuous high loads, the hopper may need to be refilled too frequently to have this operation be cost effective as a manual labor task. For these applications, it may be prudent to include the Continuous-Feed module.

If you are purchasing a system that includes the continuous feed hopper lid, you will need to purchase your own conveyor system to feed the hopper.



Loads

Minimum and Maximum loads and Electrical Configurations

An individual PP20 has a minimum required load of 3kW, and a maximum rated output of 16kW for the 50Hz configuration, and 18kW at the 60Hz configuration when outputting 3-phase AC. A 1-phase electrical configuration is available as well. In the 1-phase configuration, the machine outputs 11.2kW at 50Hz, and 12.6kW at 60Hz. 1-phase AC operation cannot be grid-tied. Under the minimum required load of 3kW, the reactor will not be hot enough to produce clean gas. Rapid fouling of the gas filter and throttle may result from running the machine at low loads.

If you require a load capacity higher than the rated power output, it is possible to synchronize several Grid-Tie model PP20s to form a microgrid.

PP20 microgrids for scaling to load

The Grid-Tie model of the PP20 can be synchronized with other AC power sources to form a microgrid. Multiple PP20s can be synchronized to form a microgrid that can support loads in excess of the rated capacity of a single PP20. We recommend using our grid-tied models for systems that are intended to supplement small scale wind turbines or solar panels.

Operational sessions

The PP20 is not designed to operate continuously for days at a time; it is designed to have operation sessions punctuated with maintenance cycles where ash and condensate are purged. The typical session is 8-24 hours.

Waste heat recovery

The PP20 has an optional Combined Heat and Power (CHP) module for recovering waste heat from the radiator coolant fluid of the engine. This CHP heat exchanger module is available for $5000 (USD) and is installed during the production of the PP20. The CHP module produces heat roughly in proportion to the load on the engine, and can provide up to approximately 20kW of thermal energy in the form of hot water. See the data sheet for the CHP module for more details.

Facilities Recommendations

When budgeting for the purchase of a PP20, be sure to factor in the cost of preparing the facility for it. The facility must:

- Protect the PP20 from rain and direct sun exposure
- Have good ventilation
- Have a fireproof hood over the flare

Accommodating the Flare and Exhaust

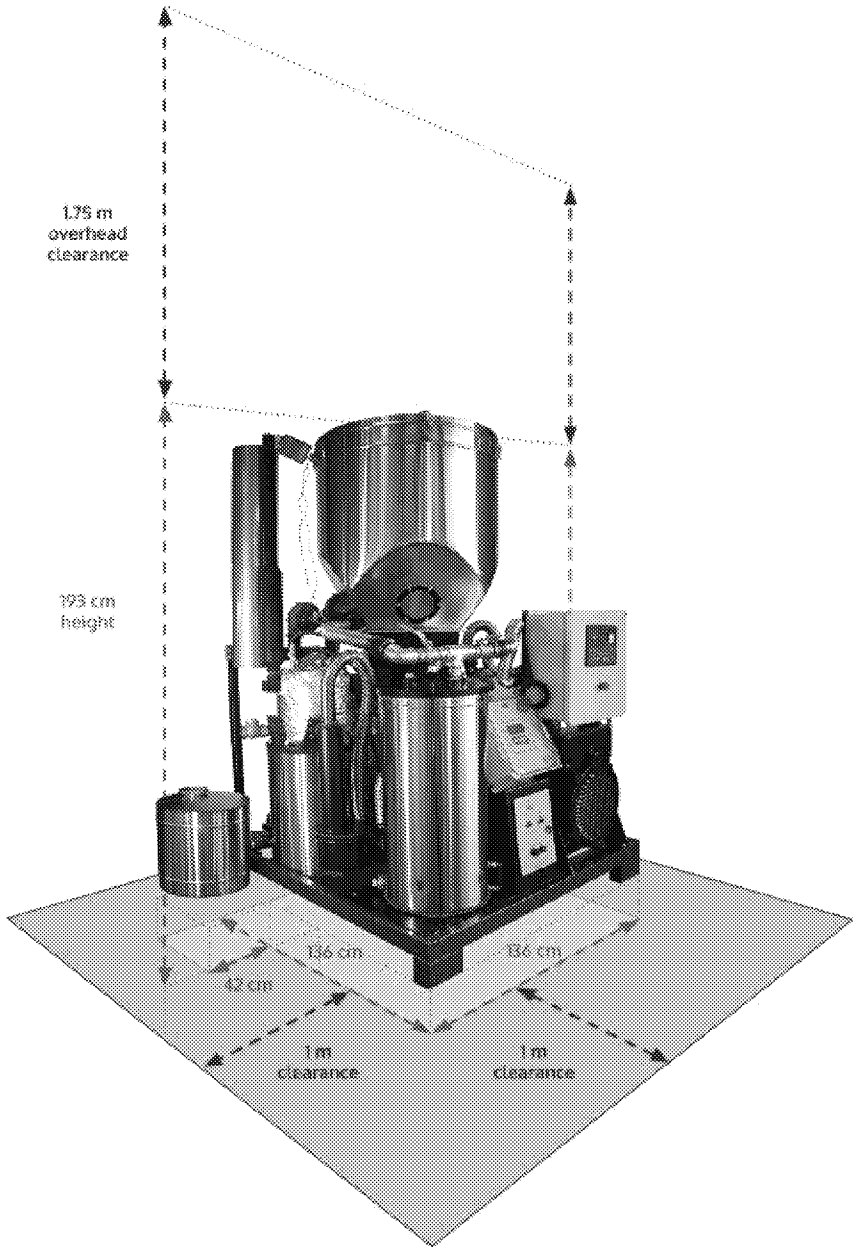
The PP20 has a flare that is used to burn off the smokey gas produced while the reactor is warming up. The facility must have a fireproof hood that can vent the flare gases, and sufficient ventilation to protect the machine operator from exhaust and from any gases released during maintenance operations.

Feedstock Processing, Storage, and Refilling

We recommend that the feedstock chipping, drying, and storing equipment and structures be built together with the facility that houses the PP20. If you intend to refill your PP20's hopper manually, we also recommend building a mezzanine just tall enough to facilitate the refilling process. Otherwise, manual refilling will involve having a worker climb a ladder multiple times with a bucket to refill the hopper.

Minimum Clearance Requirements

The PP20 requires at least 1 meter of clearance on all sides, and at least 1.75 meters overhead.



Maintenance

Daily maintenance involves

- Refilling the hopper when it is ¼ full
- Emptying out the char-ash and cyclone dust cans
- draining the condensate vessel
- Purging the engine using the purge kit.

See this technical bulletin on engine purging:

> http://www.allpowerlabs.com/wp-content/uploads/2016/08/APLTB-2016-0020EnginePurgeUpgradeSmall.pdf

Other maintenance tasks that are fairly frequent are:

- Regenerating the filter media and changing the filter media
- Cleaning out the cyclone and drying bucket heat exchange conduits
- Cleaning the pre-filter heat exchanger
- Changing the engine oil

The gas filter must be packed with charcoal pieces recovered from the char ash. With the version 1.1 filter (available in February 2017), the char-ash produced by the machine after running for 80 hours is sufficient to fill the gas filter with fresh filtration media. As the filter becomes dirty, the filter media can be regenerated by stirring it with an auger we provide. After 3-4 regenerations, the filter media should be replaced with fresh charcoal pieces.

Other maintenance tasks are indicated on the maintenance schedule shown below:

Service Interval Hours:	20	62	125	500	
Service Interval Calendar (@3500hr/yr):	Daily	3 Days	Weekly	Monthly	
Post-shutdown Engine purge using purge kit	✓				10 min
Empty ash vessel, cyclone dust, and condensate	✓				30 min
Regenerate filter media		✓			20 min
Change filter media			✓		45-60 min
Clean pre-filter heat exchanger			✓		30 min
Engine Oil Change and Component Cleaning				✓	60 min

Electrical Distribution and Load Balancing

You will need some way of distributing the electricity generated by the PP20. We recommend obtaining a distribution box or having your electrician plan the circuitry for distributing the electricity.

See the list of supported electrical configurations for details about electrical configuration options.

Shipping Costs

Our pro-forma price quotes do not include the cost of shipping because it changes weekly, but the lead time for the PP20 is 120 days. Any shipping price quoted would only be valid for 30 days at most. To obtain a shipping estimate, please provide the name of the nearest port or airport that can receive cargo. We ship according Incoterms Ex Works rules (EXW).